Listing of Claims

1. (Currently amended) A method for determining a position ($P_{xyz}(MT)$) of a signal transmitter (MT) comprising the steps of:

receiving a direct sequence spread spectrum signal (S_{MT}) from the transmitter (MT) in each of at least three physically separated sensors (100a, 100b, 100c, 100d) whose respective positions are known, the signal (S_{MT}) representing a set of symbols,

correlating, in each of the sensors (100a, 100b, 100c, 100d) a representation (S_{BB}, $<S_{BB}>$) of the received signal (S_{MT}) with at least one local spreading sequence (S_{PP}, S_{bin}) to determine a respective estimated transmission delay (d) of the received signal (S_{MT}), the received direct sequence spread spectrum signal (S_{MT}) having a nominal chip period (T_C), the correlating step producing a chip level synchronization at least within an uncertainty region of one half nominal chip period ($T_C/2$), and

calculating a distance (D_{MT-100}) between the signal transmitter (MT) and each of the at least three sensors (100a, 100b, 100c, 100d) based on the respective estimated transmission delays (d), ~~**characterized by**~~ wherein the correlating step comprising the further sub-steps of:

over-sampling the representation (S_{BB}) of the received signal (S_{MT}) within the uncertainty region to obtain a corresponding over-sampled representation of the received signal ($<S_{BB}>$), the over-sampling being equivalent to a reduced chip period (T_{C1}) which is shorter than the nominal chip period (T_C),

selecting a local spreading sequence (S_{PP}) containing poly-phased symbol values which are different from the set of symbols represented by the received signal (S_{MT}), the selected local spreading sequence (S_{PP}) having a nominal chip period being equivalent to the reduced chip period (T_{C1}), and

cross-correlating the over-sampled representation ($<S_{BB}>$) of the received signal (S_{MT}) with the selected local spreading sequence (S_{PP}) to obtain an improved uncertainty region which is more limited than one half nominal chip period ($T_C/2$).

2. (Currently amended) A method according to claim 1, ~~**characterized by,**~~ wherein prior to said cross-correlating sub-step, the correlating step involving an auto-correlating

sub-step wherein the representation (S_{BB}) of the received signal (S_{MT}) is correlated with a local copy (S_{bin}) of the transmitted spreading sequence to provide an uncertainty region of one half nominal chip period ($T_C/2$) around an auto-correlation peak (501).

3. (Currently amended) A method according to ~~any one of claims 1 or 2,~~ ~~**characterized by**~~ claim 1 further comprising the steps of:

examining a phase difference function ($\Delta\varphi$) which describes a phase difference between neighboring samples in a cross-correlation function resulting from said cross-correlating sub-step,

detecting a position (P) in said phase difference function ($\Delta\varphi$) where the phase difference between neighboring samples exceeds a predetermined magnitude ($\Delta\varphi_{Th}$), and

defining the improved uncertainty region adjacent to samples in the over-sampled representation of the received signal ($<S_{BB}>$) equivalent to said position (P).

4. (Currently amended) A method according to ~~any one of the preceding claims~~ claim 1, wherein ~~**characterized by**~~ the improved uncertainty region having an extension which is equal to one half reduced chip period ($T_{C1}/2$).

5. (Currently amended) A method according to ~~any one of the preceding claims~~ claim 1, wherein ~~**characterized by**~~ repeating said further sub-steps with progressively reduced chip periods and uncertainty regions until a desired limitation of the uncertainty region is achieved.

6. (Currently amended) A method according to claim 5, ~~**characterized by**~~ wherein the reduced chip period (T_{C1}) with respect to a first over-sampling representing an over-sampling by an integer factor of the transmitted direct sequence spread spectrum signal (S_{MT}), said integer factor being larger than one.

7. (Currently amended) A method according to claim 6, ~~**characterized by**~~ wherein the reduced chip period (T_{Cn}) with respect to any subsequent over-sampling after the first over-sampling representing an integer factor times a foregoing over-sampling, said integer factor being larger than one.

8. (Currently amended) A method according to ~~any one of the preceding claims,~~ ~~**characterized by**~~ claim 1, wherein the over-sampling involving a linear interpolation between neighboring sampling points.

9. (Currently amended) A method according to ~~any one of the claims 1 – 7,~~ ~~**characterized by**~~ claim 1, wherein the over-sampling involving one or more repetitions of each sampling value.

10. (Currently amended) A computer program directly loadable into the internal memory of a computer, ~~comprising software for controlling the steps of any of the claims 1 – 9 when said program is run on the computer.~~ comprising program code for determining a position (P_{xyz}(MT)) of a signal transmitter (MT), the program code comprises sets of instructions for:

receiving a direct sequence spread spectrum signal (S_{MT}) from the transmitter (MT) in each of at least three physically separated sensors (100a, 100b, 100c, 100d) whose respective positions are known, the signal (S_{MT}) representing a set of symbols,

correlating, in each of the sensors (100a, 100b, 100c, 100d) a representation (S_{BB}, $<S_{BB}>$) of the received signal (S_{MT}) with at least one local spreading sequence (S_{PP}, S_{bin}) to determine a respective estimated transmission delay (d) of the received signal (S_{MT}), the received direct sequence spread spectrum signal (S_{MT}) having a nominal chip period (T_C), the correlating step producing a chip level synchronization at least within an uncertainty region of one half nominal chip period ($T_C/2$), and

calculating a distance (D_{MT-100}) between the signal transmitter (MT) and each of the at least three sensors (100a, 100b, 100c, 100d) based on the respective estimated transmission delays (d), wherein the correlating step comprising the further sub-steps of:

over-sampling the representation (S_{BB}) of the received signal (S_{MT}) within the un-

certainty region to obtain a corresponding over-sampled representation of the received signal ($<S_{BB}>$), the over-sampling being equivalent to a reduced chip period (T_{C1}) which is shorter than the nominal chip period (T_C),

selecting a local spreading sequence (S_{PP}) containing poly-phased symbol values which are different from the set of symbols represented by the received signal (S_{MT}), the selected local spreading sequence (S_{PP}) having a nominal chip period being equivalent to the reduced chip period (T_{C1}), and

cross-correlating the over-sampled representation ($<S_{BB}>$) of the received signal (S_{MT}) with the selected local spreading sequence (S_{PP}) to obtain an improved uncertainty region which is more limited than one half nominal chip period ($T_C/2$).

11. (Currently amended) A computer readable medium, having a program code recorded thereon, ~~where the program is to make a computer control the steps of any of the claims 1 – 9.~~ wherein the program code includes sets of instructions comprising:

first computer instructions for receiving a direct sequence spread spectrum signal (S_{MT}) from the transmitter (MT) in each of at least three physically separated sensors (100a, 100b, 100c, 100d) whose respective positions are known, the signal (S_{MT}) representing a set of symbols,

second computer instructions for correlating, in each of the sensors (100a, 100b, 100c, 100d) a representation (S_{BB}, $<S_{BB}>$) of the received signal (S_{MT}) with at least one local spreading sequence (S_{PP}, S_{bin}) to determine a respective estimated transmission delay (d) of the received signal (S_{MT}), the received direct sequence spread spectrum signal (S_{MT}) having a nominal chip period (T_C), the correlating step producing a chip level synchronization at least within an uncertainty region of one half nominal chip period ($T_C/2$), and

third computer instructions for calculating a distance ($D_{MT\text{-}100}$) between the signal transmitter (MT) and each of the at least three sensors (100a, 100b, 100c, 100d) based on the respective estimated transmission delays (d), wherein the correlating step comprising the further sub-steps of:

forth computer instructions for over-sampling the representation (S_{BB}) of the received signal (S_{MT}) within the uncertainty region to obtain a corresponding over-

sampled representation of the received signal ($<S_{BB}>$), the over-sampling being equivalent to a reduced chip period (T_{C1}) which is shorter than the nominal chip period (T_C),

fifth computer instructions for selecting a local spreading sequence (S_{PP}) containing poly-phased symbol values which are different from the set of symbols represented by the received signal (S_{MT}), the selected local spreading sequence (S_{PP}) having a nominal chip period being equivalent to the reduced chip period (T_{C1}), and

sixth computer instructions for cross-correlating the over-sampled representation ($<S_{BB}>$) of the received signal (S_{MT}) with the selected local spreading sequence (S_{PP}) to obtain an improved uncertainty region which is more limited than one half nominal chip period ($T_C/2$).

12. (Currently amended) A sensor (100) for determining a distance (D_{MT-100}) to a signal transmitter (MT) based on a direct sequence spread spectrum signal (S_{MT}) received from the transmitter (MT), the signal (S_{MT}) representing a set of symbols, the sensor (100) comprising:

a timing unit (220) adapted to determine an estimated transmission delay (d) of the received signal (S_{MT}) based on a correlation between at least one representation (S_{BB}, $<S_{BB}>$) of the received signal (S_{MT}) and at least one local spreading sequence (S_{PP}, S_{bin}), the received direct sequence spread spectrum signal (S_{MT}) having a nominal chip period (T_C), the timing unit (220) being adapted to produce a chip level synchronization at least within an uncertainty region of one half nominal chip period ($T_C/2$), and

a calculating circuit (230) adapted to calculate the distance (D_{MT-100}) on the basis of the transmission delay (d) produced by said timing unit (220), **~~characterized in that~~** wherein the timing unit (220) comprises:

a sampling circuit (221) adapted to over-sample the representation (S_{BB}) of the received signal (S_{MT}) within the uncertainty region to produce a corresponding over-sampled representation ($<S_{BB}>$) of the received signal (S_{MT}), the over-sampling being equivalent to a reduced chip period (T_{C1}) which is shorter than the nominal chip period (T_C),

at least one bank of spreading sequences (223a) adapted to provide a local spreading sequence (S_{PP}) containing poly-phased symbol values which are different from the set of symbols represented by the signal (S_{MT}), said local spreading sequence (S_{PP}) having a nominal chip period which is equivalent to the reduced chip period (T_{C1}), and

a correlating circuit (222) adapted to cross-correlate the over-sampled representation (<S_{BB}>) of the received signal (S_{MT}) with said local spreading sequence (S_{PP}) to obtain an improved uncertainty region being more limited than one half nominal chip period ($T_C/2$).

13. (Currently amended) A sensor (100) according to claim 12, ~~**characterized in that**~~ wherein the timing unit (220) is adapted to, before cross-correlating the over-sampled representation (<S_{BB}>) of the received signal (S_{MT}) with said local spreading sequence (S_{PP}), auto-correlate the representation (S_{BB}) of the received signal (S_{MT}) with a local copy (S_{bin}) of the transmitted spreading sequence from the at least one bank of spreading sequences (223b) such that a chip level synchronization is obtained within an uncertainty region of one half nominal chip period ($T_C/2$) around an auto-correlation peak.

14. (Currently amended) A sensor (100) according to ~~any one of the claims 12 or 13,~~ ~~**characterized in that**~~ claim 12, wherein it comprises a control circuit (240) adapted to control the timing unit (220) such that for a particular representation (S_{BB}, <S_{BB}>) of the received signal (S_{MT}) the at least one bank of spreading sequences (223a, 223b) provides an appropriate local spreading sequence (S_{PP}; S_{bin}) to the correlating circuit (222).

15. (Currently amended) A system for determining a position ($P_{xyz}(MT)$) of a signal transmitter (MT) transmitting a direct sequence spread spectrum signal (S_{MT}), comprising

at least three physically separated sensors (100a, 100b, 100c, 100d), each

sensor being adapted to receive the signal (S_{MT}) transmitted from the signal transmitter (MT), the respective position of each sensor being known, and

a central node (110) adapted to receive distance data ($D_{MT\text{-}100}$) from each of the sensors (100a, 100b, 100c, 100d), the distance data ($D_{MT\text{-}100}$) representing a respective distance between the transmitter (MT) and the sensor (100a, 100b, 100c, 100d), ~~**characterized in that**~~ wherein each of the sensors (100a, 100b, 100c, 100d) is ~~a~~ the sensor (100) ~~according to any one of the claims 12 – 14.~~ according to claim 12.